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**REQUEST FOR ACCESS OF ABANDONED APPLICATION UNDER 37 CFR 1.14(a)**

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In re Application of

Application Number

671337566

Filed

4-13-89

Group Art Unit

Examiner

Paper No. #27

Assistant Commissioner for Patents  
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I hereby request access under 37 CFR 1.14(a)(3)(iv) to the application file record of the above-identified ABANDONED application, which is: (CHECK ONE)

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(D) an application in which the applicant has filed an authorization to lay open the complete application to the public.

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Unit: File Information

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#27

United States Patent [19]

Harari et al.

[11] Patent Number: 5,602,987

[45] Date of Patent: Feb. 11, 1997

## [54] FLASH EEPROM SYSTEM

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[73] Assignee: SanDisk Corporation, Sunnyvale, Calif.

6017856-2	2/1986	Japan
61-96598	5/1986	Japan
62-283496	12/1987	Japan
62-283497	12/1987	Japan
63-183700	7/1988	Japan
01054543	3/1989	Japan
2136992	9/1984	United Kingdom
WO8400628	2/1984	WIPO

[21] Appl. No.: 174,768

[22] Filed: Dec. 29, 1993

## Related U.S. Application Data

[60] Continuation of Ser. No. 963,838, Oct. 20, 1992, Pat. No. 5,297,148, which is a division of Ser. No. 337,566, Apr. 13, 1989, abandoned.

[51] Int. Cl.<sup>6</sup> G06F 11/00

[52] U.S. Cl. 395/182.06; 365/200; 365/210; 395/427

[58] Field of Search 371/10.2, 10.3, 371/40.1; 365/200, 185.09, 201, 189.07; 395/575, 182.03, 182.04, 182.05, 182.06, 427, 430

## [56] References Cited

## U.S. PATENT DOCUMENTS

3,633,175	1/1972	Harper	395/435
4,051,354	5/1977	Choate	365/200
4,093,985	6/1978	Das	395/185.02

(List continued on next page.)

## FOREIGN PATENT DOCUMENTS

557723	1/1987	Australia
0086886	8/1983	European Pat. Of.
0220718	5/1987	European Pat. Of.
0243503	11/1987	European Pat. Of.
0300264	1/1989	European Pat. Of.
58-215794	12/1983	Japan
58-215795	12/1983	Japan
59-45695	3/1984	Japan
59-162695	9/1984	Japan
60-076097	4/1985	Japan
60-212900	10/1985	Japan

## OTHER PUBLICATIONS

Miller, "Semidisk Disk Emulator," *Interface Age*, p. 102, Nov., 1982.

Clewin, "Bubble Memories as a Floppy Disk Replacement,"

1978 *Midcon Technical Papers*, vol. 2, pp. 1-7, Dec. 1978.

Hancock, "Architecting a CCD Replacement for the IBM 2305 Fixed Head Disk Drive," *Eighteenth IEEE Computer Society International Conference*, pp. 182-184, 1979.

Wilson, "1-Mbit flash memories seek their role in system design," *Computer Design*, vol. 28, No. 5, pp. 30-32, (Mar. 1989).

(List continued on next page.)

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## [57] ABSTRACT

A system of Flash EEPROM memory chips with controlling circuits serves as non-volatile memory such as that provided by magnetic disk drives. Improvements include selective multiple sector erase, in which any combinations of Flash sectors may be erased together. Selective sectors among the selected combination may also be de-selected during the erase operation. Another improvement is the ability to remap and replace defective cells with substitute cells. The remapping is performed automatically as soon as a defective cell is detected. When the number of defects in a Flash sector becomes large, the whole sector is remapped. Yet another improvement is the use of a write cache to reduce the number of writes to the Flash EEPROM memory, thereby minimizing the stress to the device from undergoing too many write/erase cycling.

50 Claims, 5 Drawing Sheets

